May 1943 ET-210

UNITED STATES DEPARTMENT OF AGRICULTURE
Agricultural Research Administration
Bureau of Entomology and Plant Quarantine

AN AIR-PRESSURE TANK FOR THE PNEUMATIC APPLICATION OF LIQUID FUMIGANTS

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The apparatus described herein was developed during the course of investigations on insects affecting stored grain, especially that stored in steel bins by the Commodity Credit Corporation. It was devised to meet the need for efficient, safe, and relatively inexpensive equipment for the application of liquid fumigants to grain stored in steel bins. Further, it solves the problem of providing the required energy where mechanical or electrical energy is not available. It is an adaptation of currently available equipment. An air tank is simply substituted for the air compressor, which is a regular part of conventional equipment.

The apparatus consists of two airtight tanks, one to contain the compressed air, and the other the fumigant, with a copper tube connecting them. Provision is also made for filling the fumigant tank by means of compressed air, thus eliminating the necessity of exposing the fumigant when transferring it from the supply drum. The entire equipment is mounted on a wooden frame. Its total weight, empty, is approximately 175 pounds. It is easily carried by two men and readily placed in an auto truck. The assembled equipment is shown in figure 1 and set up for operation in figure 2. The details of construction are given in figures 3 and 4.

Operation

To operate, the air-pressure tank is filled to 150 pounds of pressure at an ordinary gasoline station. The fumigant tank may be filled with the aid of the pressure tank (fig. 4). Air under relatively low pressure forces the fumigant from the supply drum into the fumigant tank.

To apply the fumigant, the pressure is allowed to increase in the fumigant tank from the pressure tank, forcing the fumigant out through the delivery hose and the spray nozzle in a coarse spray. At a pressure of 20 pounds per square inch in the fumigant tank, the rate of flow of the fumigant is approximately 1 gallon per minute, depending upon the height to which the fumigant must be raised. It is usually possible to fill and empty the fumigant tank three times with a single charge of the air tank with pressure of 150 pounds per square inch.

The equipment described above has the following advantages:

(1) It can be used at grain-storage sites where mechanical energy for operating an air compressor is not available.

(2) It is relatively safe from explosion hazards, through the elimination of an air compressor and gasoline or electric motor. However, the precaution of having the apparatus and the delivery nozzle grounded should be taken if an inflammable fumigant is being used.

(3) The equipment is economical in both initial cost and operation.

(4) It is simple in construction and operation.

(5) It is light and mobile.

List of Materials

The parts required for the construction of the apparatus are listed below:

Parts for equipment proper --

1 30-gal. range boiler, heavy duty, 150 pounds' working pressure (for pressure tank)
1 18-gal. range boiler, 85 pounds' working pressure (for liquid fumigant)
1 200-lb. pressure gauge (for pressure tank)
1 75-lb. pressure gauge (for fumigant tank)
1 water gauge set with 36" glass and valved gauge-glass fittings
3 ft. of 3/8" copper tubing with fittings for making connections to pressure and fumigant tanks.
(Note: If copper tubing is not available, 1/4" galvanized iron pipe may be substituted.)
1 1/2" pipe to hose connection.
1 35-ft. length of 1/2" oil- and fumigant-resistant, high-pressure (100 lbs.) rubber hose
1 10-ft. length of 1/4" high-pressure (150 lbs.) air hose

1 air valve (from auto tube)
1 air hose chuck for insertion in 1/4" rubber hose
2 hose clamps for 1/4" hose
2 hose clamps for 1/2" hose
2 ft. of 3/8" galv. iron pipe for nozzle for fumigant hose, one end threaded, other end flattened to an opening of the thickness of a hacksaw blade
2 1/4" globe valves
1 1/2" globe valve
3 1/4" tees
1 1/2" elbow
4 1" x 1/4" nipples
1 3" x 1/2" nipple
2 ft. of 1/2" galvanized iron pipe (for attaching hose at bottom of fumigant tank)
Plugs for closing unused outlets in tanks (size and number depend on number and size of unused openings in tanks)
1 1" plug for top of fumigant tank
1 length of strap iron 12"x1-1/2"x1/4" (to be welded on above plug to form bar handle)
Note: It will probably be necessary to drill and thread openings for various pipe and water gauge connections in the range boilers.

Parts for filling apparatus —

2-1/2 ft. of 3/4" galvanized iron pipe
1 6"x3/4" nipple
3 2"x3/4" nipples
1 3/4" globe valve
2 3/4" elbows
1 3/4" union
1 8-ft. length of 3/4" oil- and fumigant-resistant, low-pressure rubber hose
2 hose clamps for 3/4" hose
1 1/4" cross
1 1/4" elbow
1 2"x1/4" nipple
1 4"x1/4" nipple
1 5-lb. pressure gauge
1 1/4" petcock
1 air valve (from auto tube)
1 cast iron plug from fumigant or steel drum (2-1/2" diameter). This is to be drilled for 3/4" pipe and 1/4" nipple (air intake)
2-1/2-ft. length of 3/4" pipe welded in the plug. Pipe to extend 22" through plug (diameter of 55-gal. fumigant drum)
4"x1/4" nipple also welded in plug beside larger pipe, bottom end flush with inside of plug
2 6" lengths of strap iron 1x1/2"x1/4" (to be welded on above plug to form bar handle)

Parts for supporting frame —

8 1/4"x7" carriage bolts
8 1/4"x6" machine bolts
1 3/8"x2" machine bolt
4 pieces 2"x4"x4' fir dimension lumber
2 pieces 2"x4"x6' fir dimension lumber
4 ft. of 1"x1/8" strap iron
5 ft. of 1/2"x1/8" strap iron

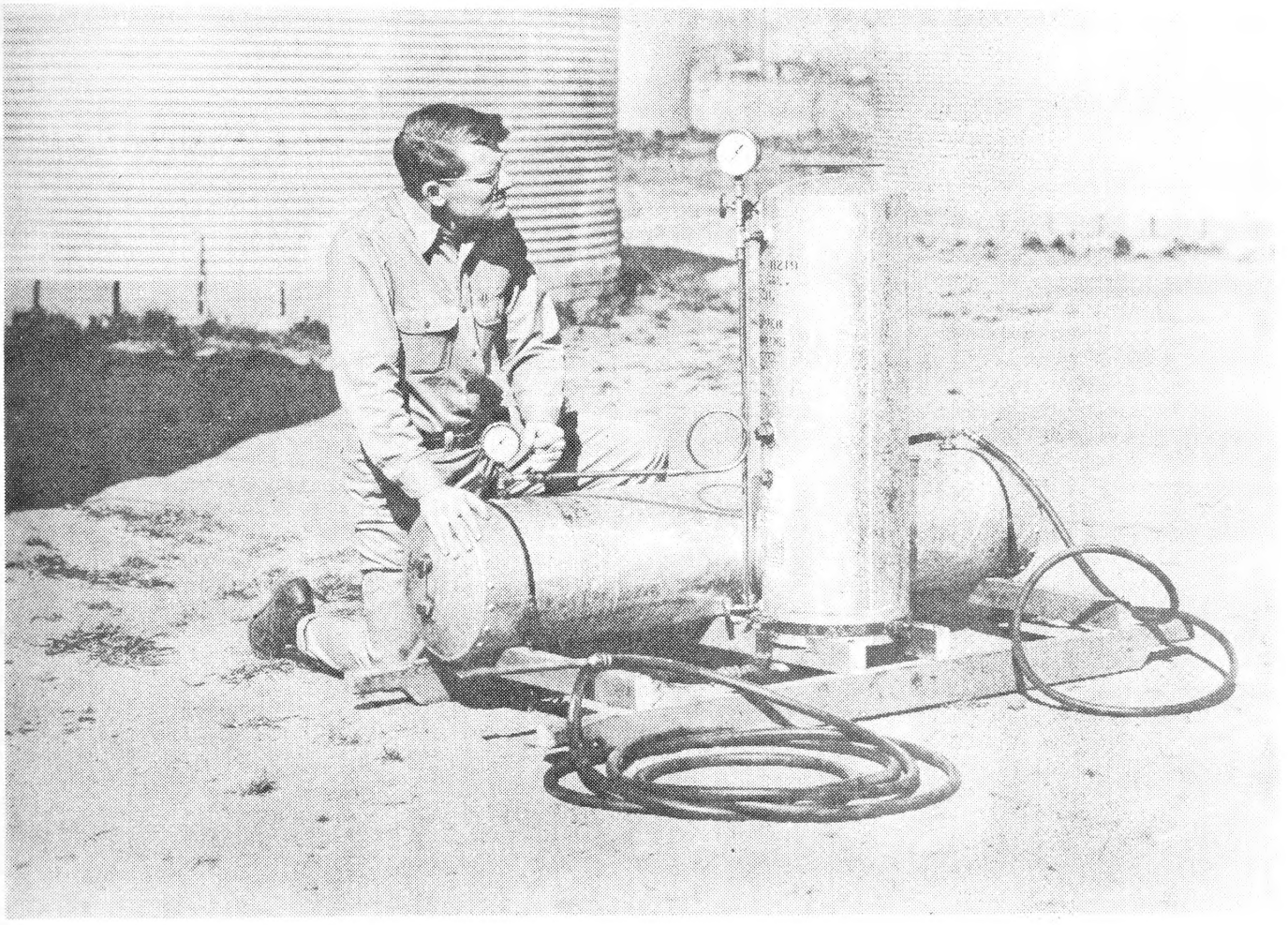

Figure 1.--The assembled equipment ready for use. The upright tank contains the liquid, and the horizontal tank contains the compressed air. The pressure gauge on the air tank indicates air supply, and the gauge glass on the fumigant tank indicates the amount of fumigant remaining in the tank. In this photograph an air hose is shown connected to the intake valve to indicate how an air line at a supply station may be used to fill the air tank.

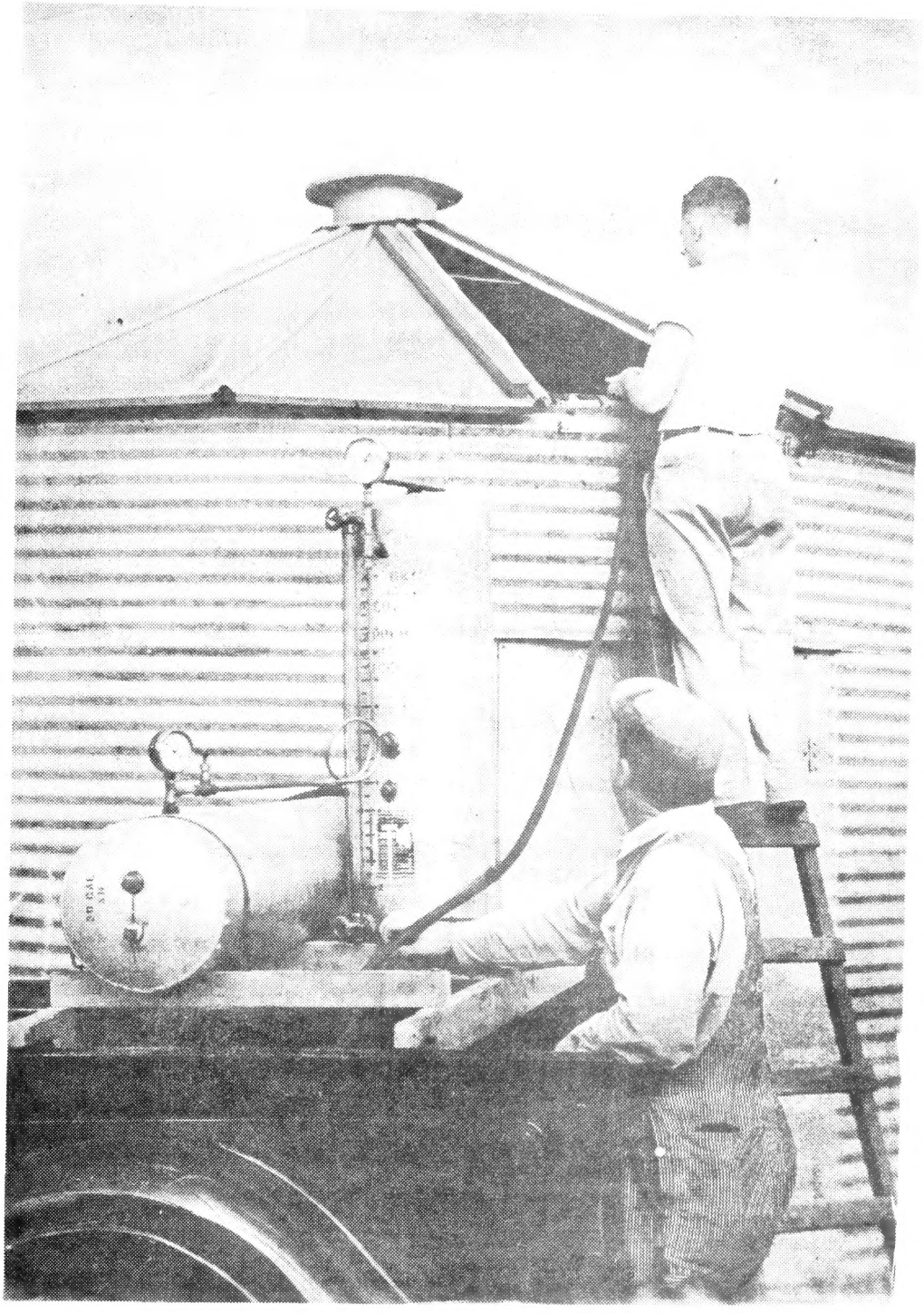

Figure 2.--The equipment set up for operation. The desired pressure in the fumigant tank is maintained by adjustment of the hand-operated valve while the fumigant is being applied.

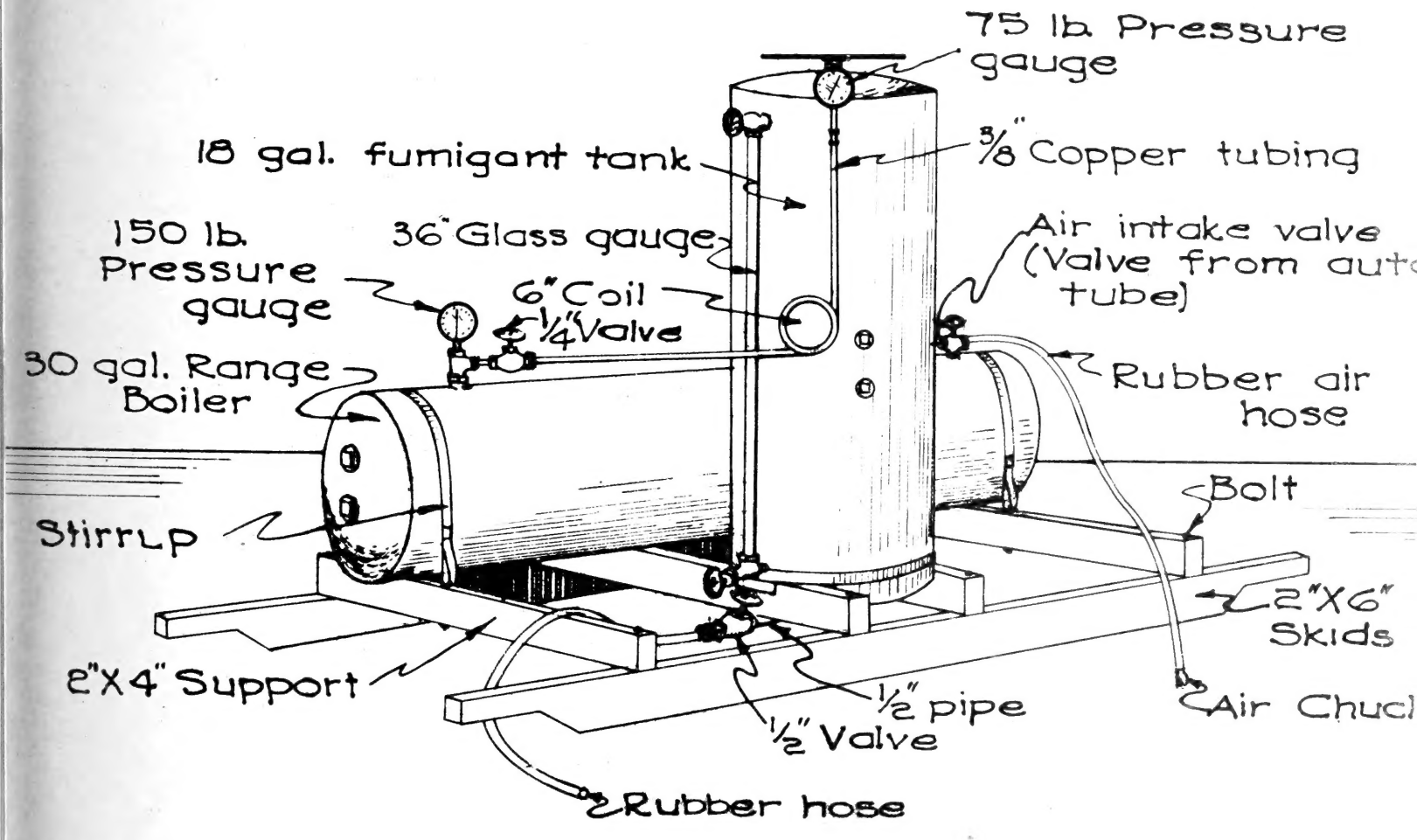

Figure 3.--Details of construction.

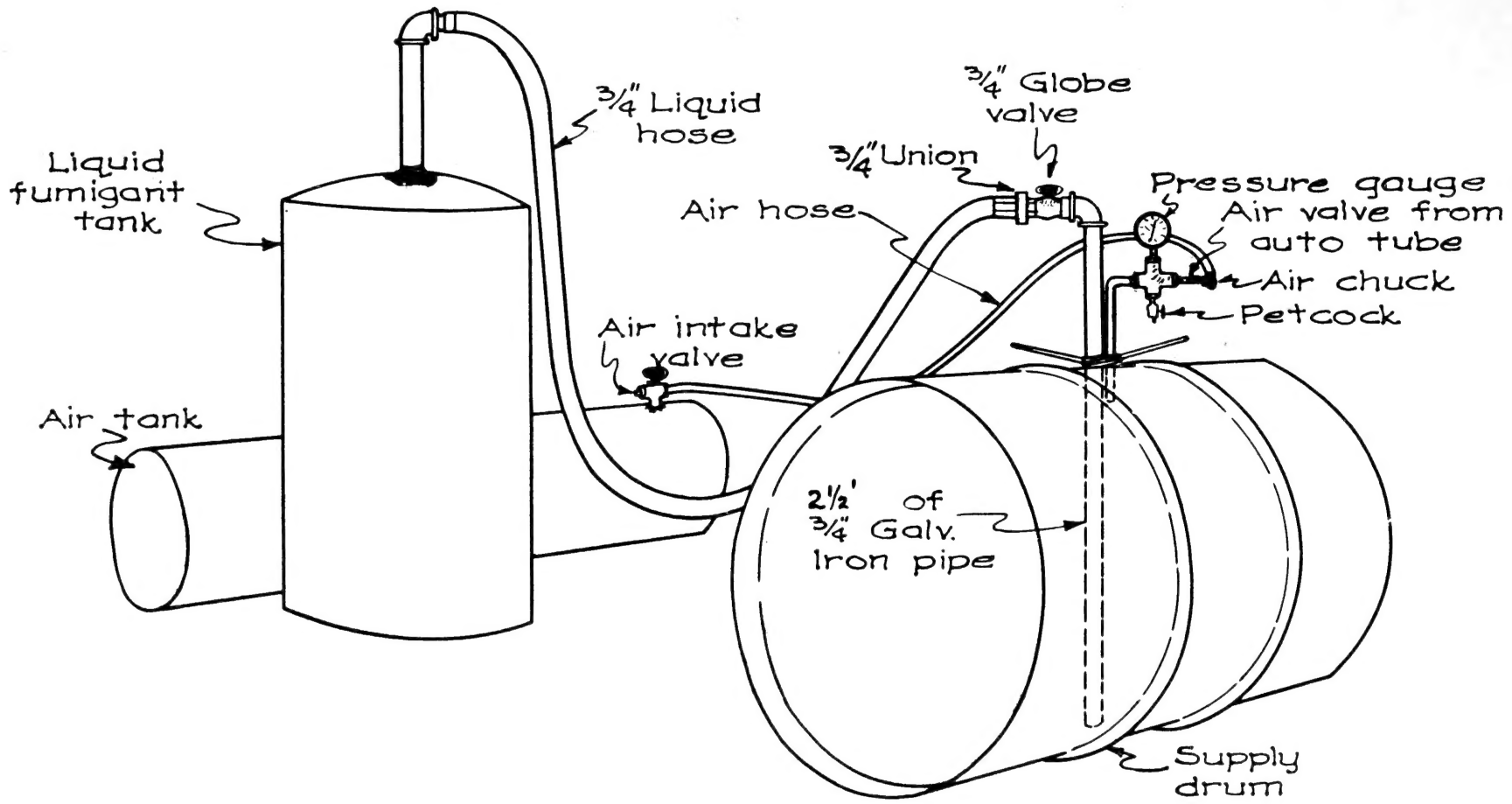

Figure 4.--Method of using pressure tank in filling fumigant tank from supply drum.